Below this point the spectrum is rather hard to describe in a table. The wave-lengths have therefore been attached to a sketch.

The indicated breadth of H_α does not mean that it is not monochromatic. The bright hydrogen lines, where not over-exposed, are about as broad as the comparison lines. 6289 looks like a monochromatic line.

The solid line sketch was made with the plate under the microscope. Subsequently, on examination of the negative with a lower power, details seem to be brought out which have been inserted in broken lines. The sketch is based on measurements of the negative, and the dispersion is therefore prismatic, so you can compare it directly with your positives—allowing, of course, for difference in scale.

Preliminary Observations of Spiral Nebulæ in Polarised Light.

By J. H. Reynolds.

A possible explanation of the stellar spectrum given by the great majority of spiral nebulæ is that some proportion of the light may be reflected from a central star or stars, involved in the nucleus. Long-exposure photographs tend to blot out the true character of the nucleus, which is usually globular in form with the maximum of light at the centre. The main reasons which favour the adoption of this as a provisional hypothesis may be enumerated as follows:—

1. The few cases in which spectrograms of spiral nebulæ have been secured include one at least where the continuous spectrum is crossed by bright lines of nebulium and hydrogen (N.G.C. 1068, 5-foot reflector, Mount Wilson). Sir William Huggins also recorded the existence of bright lines seen visually in the spectrum of the Andromeda Nebula (*Atlas of Representative Stellar Spectra*). The analogous character of cometary spectra is apparent.

2. In some authenticated instances of variable nebulæ, the nebulæ have been situated in close proximity to variable stars (T Tauri, R Coronæ Australis, Nova Persei).

3. Where spiral nebulæ are seen nearly edgewise, as is evidently the case with such examples as N.G.C. 3628, they are crossed by a dark band. It may be inferred that the matter forming the outer portions of the spiral is not sufficiently illuminated to affect the photographic plate, but is dense enough to absorb the light having its origin in the stellar nucleus.

It was suggested by Mr. F. J. M. Stratton that the hypothesis might be tested by means of polarised light, and Prof. Newall further proposed that a double-image prism should be used for photography. Both these valuable suggestions were adopted.

The first attempt to apply this test was made with a Nicol prism and positive eyepiece loaned by the Society, used in conjunction with the 28-inch reflector at Harborne. Some indications of

polarisation were made out with this apparatus; but the observations were complicated by the polarisation introduced by the 45° plane of the reflector, so that it was impossible to be certain whether the polarisation lay in the nebulæ or the mirrors.

A double-image prism was therefore substituted for the Nicol. This has the great advantage that the two images of the nebula can be seen side by side in opposite polarisations and the polarisation introduced by the telescope itself is nullified.

The nebula which was chosen as most suitable for this purpose was M64. This object, which is in Coma Berenices, is one of the brightest and largest of this region, and is inclined at a considerable angle to the line of sight: there is also a star of about the same magnitude as the nucleus, which lies a little to the north of the nebula.

The double-image prism seemed to show a decided difference in the visual appearance of the two images as the prism was rotated, although they were, of course, very faint. To put the matter to a final test, however, it was decided to employ photography. The apparatus was arranged so that the prism could be placed in the focal cone, the two images being brought to a focus about 5 millimetres apart; this allowed the full aperture of the reflector to be used. The prism could also be rotated to bring the axis through either the major or minor axes of the two nebular images.

Several nights were spent in experimenting as to the position of the best focus, and in ascertaining the amount of distortion introduced by the prism.

It was found that the best focus of the polarised images lay about 2 millimetres behind the normal plane, and that the two star images were distorted in different directions. It also became evident that no exposure of less than $2\frac{1}{2}$ hours would under ordinary circumstances bring out sufficient density for the images to be examined.

A photograph with this length of exposure was obtained on 1912 April 11, with the axis of the prism passing through the minor axes of the nebular images. On examination there was seen what appeared to be a real difference between the two nebular images. One of the images (N1) exhibits its maximum brightness at right angles to the axis of the prism: the other (N2) is nearly circular in its brightest part, but has been considerably distorted in the direction indicated by the corresponding star image: if allowance is made for this distortion, the second image would appear to have its maximum brightness in a direction at right angles to the first. This effect would be expected if polarisation were present under the conditions required by the hypothesis. The image N1 is appreciably fainter as a whole than N2, but as this difference extends to the corresponding star images it is undoubtedly instrumental in its origin. The question of the reality or otherwise of the polarisation effect would be much simplified if the apparatus were employed on a larger and brighter spiral, where the amount of distortion of the images would be

small compared with their size: in such a case the polarisation would be plainly revealed if present. It is proposed therefore to make a further test of the hypothesis when the Andromeda Nebula is accessible.

I should like to record my obligations to Mr. Stratton and Prof. Newall for their assistance and advice.

Note added 1912 *May* 23.

But, in addition to the polarisation effect, there is another effect we should expect to find if the hypothesis is correct. If we take the case of a spiral nebula the plane of which lies at an angle of 45° or less to the line of sight, the reflection from the earthward half of the nebula would be oblique, with the maximum of obliquity along the minor axis of the ellipse. On the other hand, the reflection from the further half would be acute, so we should look for the earthward half to be the brighter of the two. Over 45° this brightening would not be marked, but the effect would increase as the angle with the line of sight decreased. An examination of photographs of spiral nebulæ confirms the existence of this feature: among those showing it conspicuously are N.G.C. 224, 2683, 2841, 3031, 4501, and 7331: in the case of N.G.C. 2683, where the inclination is only about 10°, one-half of the ellipse is almost invisible. There is a point in this connection, however, which seems rather significant: the oblique illumination effect is apparently almost non-existent in nebulæ of the hard, granular type, all the examples mentioned above being mainly of the soft, filmy type. There is evidently a fundamental distinction between these two types, although both are sometimes found in the same nebula.

On the Motions and Distances of certain Stars of the Types B8 and B9. By H. C. Plummer, M.A.

1. The apparent general success which was met with in applying the hypothesis that the stars of type A are moving parallel to the plane of the Milky Way to an investigation of their motions and distances gives an incentive to the attempt to extend the inquiry to other classes of stars. In general we cannot expect the same measure of success, since the radial velocities of other types have not revealed the property which formed the starting-point of the previous investigation—namely, that the larger components of the velocity in the line of sight are associated with the stars in the lower galactic latitudes. But there are certain stars—those of types B8 and B9—for which satisfactory results appeared quite possible, because Mr. B. Boss has suggested that these stars, in virtue of their proper motions, are to be connected rather with the A type than with the other B type stars. It seemed therefore worth while to make this supposition, and the results appear to justify this course. The material was taken from a MS. list of radial motions of the